

REMARKS

This Amendment responds to the Office Action dated September 18, 2006 in which the Examiner rejected claims 1, and 3-9 under 35 U.S.C. §101, under 35 U.S.C. §112 second paragraph and under 35 U.S.C. §103.

Applicant respectfully traverse the Examiner's rejection of the claims under 35 U.S.C. §101. In particular, the claims are directed to comparing measured data and simulation data both before and after chemical mechanical polishing processes to obtain first and second correlation coefficients and to adjust parameters such that the correlation coefficients become a maximum. Therefore, Applicant respectfully submits that the claims produce a useful, concrete and tangible result and thus are directed to statutory subject matter. Therefore, Applicant respectfully requests the Examiner withdraws the rejection to claims 1 and 3-9 under 35 U.S.C. §101.

As indicated above, claim 1 has been amended in order to more particularly point out and distinctly claim the subject matter which the Applicant regards as the invention. Therefore, Applicant respectfully requests the Examiner withdraws the rejection to claims 1 and 3-9 under 35 U.S.C. §112 second paragraph.

Claims 1 and 3-9 were rejected under 35 U.S.C. §103 as being unpatentable over *Kim et al.* (U.S. Patent No. 6,484,300) in view of *Dickenscheid et al.* (U.S. Patent No. 6,965,809) and further in view of *Adler et al.* (U.S. Patent Publication No. 2002/0161534).

Applicant respectfully traverses the Examiner's rejection of the claims under 35 U.S.C. §103. The claims have been reviewed in light of the Office Action, and for reasons which will be set forth below, Applicant respectfully requests the Examiner withdraws the rejection to the claims and allows the claims to issue.

Kim et al. appears to disclose systems, methods and computer program products for determining a density of a pattern in an integrated circuit and for simulating a chemical-mechanical polishing process using the density that was determined. (Column 1, lines 13-17). Embodiments can provide systems, methods and/or computer program products that can obtain an effective pattern density of a layer of an integrated circuit from layout data that defines the layout. A grid of pattern cells is defined for the layout data. A respective pattern density is determined for a respective the pattern cell in the grid. An effective pattern density is calculated for a first pattern cell in the grid. The effective pattern density for the first pattern cell is a function of the pattern density of at least second pattern cell in the grid that is remote from (i.e. nonadjacent) the first pattern cell, and a distance of the at least a second pattern cell from the first pattern cell. Adjacent cells also may be included, and preferably are included, in the effective pattern density. (Abstract).

Thus, *Kim et al.* merely discloses determining a density of a pattern and determining the thickness of a planarization layer as a function of CMP polishing time based on the effective pattern density (col. 3, lines 31-33). Nothing in *Kim et al.* shows, teaches or suggests comparing measured data with calculated data about two-dimensional height distribution both before and after chemical mechanical polishing, obtaining correction coefficients and adjustment thereof to become maximum as claimed in claim 1. Rather, *Kim et al.* merely discloses obtaining pattern density and determining the thickness of a planarization layer as a function of CMP polishing time.

Furthermore, *Kim et al.* merely discloses simulating a chemical-mechanical polishing process. Nothing in *Kim et al.* shows, teaches or suggests a Fourier

calculating part, a reverse Fourier calculating part, a spatial filter part and a height distribution calculating part as claimed in claim 1.

Dickenscheid et al. appears to disclose method for characterizing and simulating a chemical mechanical polishing process, in which a substrate that is to be polished, in particular a semiconductor wafer, is pressed onto a polishing cloth and is rotated relative to the latter for a defined polishing time. A method for characterizing and simulating a CMP process, in which a substrate to be polished, in particular a semiconductor wafer, is pressed onto a polishing cloth and is rotated relative to the latter for a defined polishing time. The method includes defining a set of process parameters, in particular a compressive force and a relative rotational speed between a substrate and polishing cloth; preparing and characterizing a test substrate having test patterns with different structure densities using the defined process parameters; determining a set of model parameters for simulating the CMP process from results of the characterization of the test substrate; determining layout parameters of the substrate which is to be polished; defining a profile of demands for a CMP process result for the substrate to be polished; and simulating the CMP process in order to determine the polishing time required to satisfy the profile of demands. (Abstract).

Thus, *Dickenscheid et al.* merely discloses simulating a CMP process in order to determine the polishing time required to satisfy a profile of demands. Nothing in *Dickenscheid et al.* shows, teaches or suggests comparing measured data with calculated data both before and after chemical mechanical polishing, obtaining correlation coefficients and adjustment thereof to maximize the correlation

coefficients as claimed in claim 1. Rather, *Dickenscheid et al.* merely discloses determining the polishing time required to satisfy a profile of demands.

Furthermore, *Dickenscheid et al.* merely discloses simulating chemical mechanical polishing. Nothing in *Dickenscheid et al.* shows, teaches or suggests a Fourier calculating part, a reverse Fourier calculating part, a spatial filter part and a height distribution calculating part as claimed in claim 1.

Adler et al. appears to disclose [0024] methods and apparatus for combining the information from two or more detectors in an inspection system, review station, CD SEM, or the like with a scanning electron beam. [0025] One object is to allow an SEM-based inspection system to address more successfully the tradeoff between sensitivity and false or nuisance defects. [0128] The second method of processing the data in an array-mode inspection with only one detector involves a Fourier transform. The purpose of this technique is to find defects. Rather than looking for differences, this technique identifies non-repeating patterns within the array. It consists of the following three steps (FIG. 13): [0129] transform the image data from the spatial domain into the frequency domain (1301), [0130] filter the Fourier transform in the frequency domain to remove at least a portion of the repeating pattern in the spatial domain (1302), and [0131] perform an inverse transform of the transformed image (1303).

Thus, *Adler* merely discloses processing data in an array mode to find defects. Nothing in *Adler et al.* shows, teaches or suggests comparing measured data with calculated data before and after chemical mechanical polishing, obtaining correlation coefficients and adjustment thereof to maximize the correlation

coefficients as claimed in claim 1. Rather, *Adler et al.* merely discloses an array-mode inspection process to find defects using Fourier transform.

A combination of *Kim et al.*, *Dickenscheid et al.* and *Adler et al.* would merely suggest to determine the thickness of a planarization layer as a function of polishing time based upon effective pattern density as taught by *Kim et al.*, to determine the polishing time as taught by *Dickenscheid et al.* and to determine defects as taught by *Adler*. Thus, nothing in the combination of the references shows, teaches or suggests comparing measured and calculated data about height distribution both before and after chemical mechanical polishing, obtaining correlation coefficients and maximizing the correlation coefficients as claimed in claim 1. Therefore, Applicant respectfully requests the Examiner withdraws the rejection to claim 1 under 35 U.S.C. §103.

Claims 3-9 depend from claim 1 and recite additional features. Applicant respectfully submits that claims 3-9 would not have been obvious within the meaning of 35 U.S.C. §103 over *Kim et al.*, *Dickenscheid et al.* and *Adler et al.* at least for the reasons as set forth above. Therefore, Applicant respectfully requests the Examiner withdraws the rejection to claims 3-9 under 35 U.S.C. §103.

The prior art of record, which is not relied upon, is acknowledged. The references taken singularly or in combination do not anticipate or make obvious the claimed invention.

Thus, it now appears that the application is in condition for reconsideration and allowance. Reconsideration and allowance at an early date are respectfully requested.

If for any reason the Examiner feels that the application is not now in condition for allowance, the Examiner is requested to contact, by telephone, the Applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed within the currently set shortened statutory period, Applicant respectfully petitions for an appropriate extension of time. The fees for such extension of time may be charged to our Deposit Account No. 02-4800.

In the event that any additional fees are due with this paper, please charge our Deposit Account No. 02-4800.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

Date: January 9, 2007

By:


Ellen Marcie Emas
Registration No. 32131

P.O. Box 1404
Alexandria, VA 22313-1404
703.836.6620